

because regulators also controlled the rate of return and were willing to risk future price increases in return for artificially lower prices in the present. These lower rates, despite inadequate depreciation, essentially resulted in artificially lower prices for interexchange carriers and other access customers. MCI therefore advocates continued use of regulated depreciation rates in order to perpetuate this windfall.⁷

As discussed in the TFI Study included as Attachment D to these comments, the MiCRA paper is premised on assumptions concerning the economic lives of telephone plant that ignore the substantial technology, regulatory, and market changes that are transforming the telecommunications industry. Other telecommunications firms, such as cable operators and long-distance providers who will be competing head-to-head with telephone companies, utilize far shorter lives than those prescribed by regulators for virtually identical plant. See TFI Study, Attachment D, at 1-2. In order to meaningfully measure productivity, a TFP study should utilize a measure of capital stock which recognizes differences between book depreciation and economic depreciation. The Christensen simplified TFP method recognizes this fact, and utilizes a meaningful, publically available measure of depreciation lives, that used by the BEA and BLS for the comparable analysis of U.S. productivity. See Christensen Reply at 19-20.

2) The Simplified Christensen Method Properly Calculates the Labor Index

Ad Hoc recommended that the TFP labor index used in the simplified Christensen TFP method be adjusted to account for one time events including “golden handshakes” given to encourage early retirements and for OPEB related expenses. Ad Hoc recommends that such

⁷In order to present an accurate picture on their balance sheet, LECs determined that they must take a one-time charge (collectively about \$40 billion) and write up their depreciation reserve to reflect the depreciated value which should have been recognized, but was not, under their depreciation rates. Pursuant to separations rules, 25% of this \$40 billion reflects a direct benefit to MCI and other interexchange carriers.

expenses should be amortized over some appropriate number of years in the future. Ad Hoc Comments at 5, ETI Study at 28.

Expenses associated with work force reduction programs are already “normalized” as suggested by Ad Hoc. As required under Responsible Accounting Order 24 (RAO 24), LECs are required to establish accruals for work force reduction programs and realize the expenses as they are actually incurred.⁸ RAO 24 requires carriers recording liabilities for work force reductions to record these amounts in an accrued liabilities account (Acct. 4120) and charge the appropriate Part 32 expense accounts when the restructuring expenses are actually paid. This accounting methodology recognizes the liability consistent with GAAP, shows the effect of restructuring on net income, and allows delayed recognition in the regulatory operating accounts until the detailed amounts are known and amounts have actually been paid. This requirement, in effect, normalizes the costs of force reduction programs undertaken by the LECs over future years. RAO 24 was adopted in March 1994 and the price cap LECs filed Year/End 1993 and subsequent ARMIS reports in accordance with this methodology.

Where LECs incur expenses for early retirement incentives which do not meet the criteria for restructuring, LECs should realize the expenses when they are incurred and should not be normalized over future years. These expenses, which are normal business activity, should not be amortized to smooth out the labor input time series. Early retirement incentives are legitimate costs of business which have been, and will continue to be, incurred by some LECs seeking to reduce future costs. To this extent, these costs should be included within the input time series and incorporated into the TFP study in the year in which the costs are incurred. Ad Hoc’s recommendation to amortize these type of costs into the future would not change the total long-term cost but would merely smooth the input time series. As such, there is no basis to incorporate such a recommendation into the price cap plan. This

⁸ See RAO 24, Accounting For Work Force Reduction Programs, Released and Adopted March 24, 1994.

recommendation is no more appropriate than one which would allow a LEC to remove revenues for its output time series and spread them over future years simply because it made business decisions which increased revenues.

3) The Simplified Christensen Method Properly Uses GDP-PI To Represent Materials

As described in the Christensen Reply, the Christensen simplified TFP model properly uses the Gross Domestic Product Price Index to represent the prices paid by LECs for their materials. AT&T proposes that the materials price index be derived from the 1977, 1987, and 1993 input/output tables of the U.S. economy and the Producer Price Indexes and Consumer Price Indexes for those industries that the input/output tables indicate sell goods and services to the telephone industry. AT&T Comments, Appendix A at 18-19. AT&T's price index does not meet the FCC's criteria of accessibility and verifiability, since it is the result of a complex set of computations that are not documented. See Christensen Reply at 21-22. Additionally, AT&T's materials index is based only on transactions between the telecommunications industry and firms outside the telecommunications industry. This shortcoming leads to biased estimates of the materials price index. See Id. As a result, AT&T's suggested material price index should be rejected. See FNPRM, para. 16.

II. Other Methods Proposed by Commenters Are Not Economically Meaningful And Would Not Serve the Public Interest

A. The AT&T "Performance-Based" Model Is Essentially A Historical Revenue Model

As explained in further detail in the attached NERA reply, AT&T's "performance-based" TFP model is essentially a revised version of the AT&T historical revenue model, not a measure of TFP. TFP measures the difference between aggregate output and input quantity indexes. The input index is constructed from the prices and quantities of inputs used by the firm in question, without imposing any pre-conditions or adjustments on either input or output.

In the historical revenue method, an adjustment is imposed on output - that is, the historical revenue method examines the input-output relationship that results when the price of output is adjusted to hold earnings to a specified level. In the performance-based model, AT&T examines the input-output relationship that results when an adjustment is made to input - when the price of capital is adjusted to make total expenditure equal total revenue. Neither the historical revenue method nor the “performance-based” method examine actual TFP. See NERA Reply at 3; Vander Weide Reply at 4-5.

Since the AT&T model does not examine actual input, it cannot measure TFP. What the AT&T model does accomplish is to reimpose rate-of-return regulation, by using accounting returns in measuring the price of capital. NERA Reply at 4; Vander Weide Reply at 4. This approach is inconsistent with the goal of developing a productivity offset on a meaningful measure of actual productivity, and ensure that there are adequate incentives to increase productivity. See, e.g., FNPRM, para 16; Id., para. 81.

B. The Commission Should Not Adopt A Historical Revenue Model

The General Services Administration (GSA), supports the historical revenue method, on the basis that this method is simple to apply, and easier to understand. GSA also apparently believes that information regarding unit cost improvements due to productivity is “of no practical significance in the determination of the X-factor.” Comments of GSA at 4. But such information is of no significance only if, as GSA believes, the purpose of the X-factor is to achieve a targeted rate of return, rather than to reflect actual productivity gains. See Id. This formulation of the X-factor is inconsistent with the Commission’s goal that the X-factor be economically meaningful, and reflect actual productivity. FNPRM, para. 16.

III. There is No Basis To Adopt Unneeded “Safeguards” For the Long-Term Price Cap Plan, Particularly Where the Productivity Offset is Calculated as a Moving Average of TFP

The FNPRM requested comment on a number of “safeguards” associated with the long-term price cap plan: the sharing mechanism, the consumer productivity dividend or CPD, and periodic reviews. See FNPRM, para 112 (sharing); Id., para. 94 (CPD); Id., para. 142 (rescheduling of performance review). Where the productivity offset is calculated as a moving average, the simplified Christensen TFP method will adequately flow through productivity gains to consumers. Accordingly, there is no need for the Commission to adopt external safeguards to ensure that rates are just and reasonable. The Commission should eliminate sharing and the CPD from the long-term price cap plan. No further review of the price cap plan needs to be scheduled at this time. A moving average TFP productivity offset will flow through productivity gains more quickly and more efficiently than periodic reviews.

A. The Comments Provide No Rational Basis for the Continuation of Sharing under the LEC Price Cap Plan

In its Price Cap Review Order, para. 193, the Commission concluded that sharing should be eliminated in the long-run from the LEC price cap plan. The Commission’s conclusion was based on substantial record evidence that sharing serves only to perpetuate the very disincentives that price cap regulation was intended to replace. See, e.g. FNPRM, para. 114; Price Cap Review Order, para. 187-89. That evidence is supported by a number of parties commenting on the sharing issue in response to the FNPRM. See, e.g., Comments of Bell Atlantic at 2-5; Bell South at 38-40; Southwestern Bell at 30-31; NYNEX at 10. These comments make clear that the long-run is now. Sharing must be eliminated if the LEC price cap plan is to fully realize the potential that the Commission first envisioned for incentive regulation for dominant carriers over five years ago.

Predictably, a few parties continue to cling to time-worn arguments in support of retaining sharing in the LEC price cap plan. AT&T, for example, summarily dismisses the

substantial record evidence that sharing blunts LEC efficiency incentives and claims that sharing is necessary for LECs to select an appropriate X-factor. See, e.g., AT&T Comments at 37-38. MCI takes a different tack, maintaining that sharing is required for the lower of two productivity factors it advocates in order “to ensure that ratepayers will receive a reasonable share of the benefits of the cost-reductions that will continue to occur under price caps.” MCI Comments at 21. Other parties rely on the old “backstop” rationale, claiming that sharing serves as a “safety net” to protect consumers against a “misspecified” (i.e., low) productivity factor, see, e.g., Ad Hoc Comments, ETI Study at 60-61; TRA Comments at 7; GSA Comments at 7.

None of these arguments withstands scrutiny. Contrary to AT&T, the evidence is overwhelming that sharing severely dampens LEC incentives to operate more efficiently. As noted in USTA’s Comments (p. 38), the Commission itself has recognized that the impact of sharing on LEC efficiency incentives is significant. See, e.g., Price Cap Review Order, para. 188 (the Commission notes that the elimination of sharing would generate at a minimum a 17 percent increase in efficiency for all LECs, and a 41 percent increase for LECs that were subject to 50-50 sharing. Ad Hoc itself recognizes the “attenuation of [LEC] efficiency incentives under a sharing requirement.” Ad Hoc Comments, ETI Study at 64.

Moreover, AT&T’s arguments, and the arguments of the other parties supporting the retention of sharing, fail to consider additional reasons as to why sharing has no place in the LEC price cap plan. As the Commission has observed, a “pure price cap plan, without earnings sharing, may encourage infrastructure development and the deployment of advanced equipment and technology.” Price Cap Review Order, para. 189. The elimination of sharing will also help to minimize regulatory burdens for both the Commission and for LECs, and will facilitate the removal of services from price cap regulation as markets become more competitive. See USTA Comments at 38-39.

The arguments in support of retaining sharing pale in comparison to the above-

described benefits that will be derived from eliminating sharing. For example, MCI's claim that sharing is necessary in order to ensure that ratepayers receive a reasonable share of the benefits of price cap regulation ignores the fact that the productivity offset is designed to accomplish precisely that. MCI provides no valid reason why sharing, with its efficiency disincentives, is necessary in addition to the productivity offset. Indeed, insofar as sharing blunts efficiency gains, it harms consumers because the pass through of those efficiency gains would be lower with sharing than without, particularly under a moving average TFP X-factor as advocated by USTA. Further, as the Commission has recognized, a moving average productivity offset makes sharing superfluous. FNPRM, para. 114 (“[B]ecause a moving average would reflect changes in unit costs under price caps, it would . . . serve the purpose of flowing through any gains to customers”); Price Cap Review Order, para. 192. In short, sharing plus a moving average productivity factor renders sharing superfluous. See Bell South Comments at 39.

Nor is sharing justified as a “backstop” or “safety net” as argued by Ad Hoc, TRA and GSA. The Commission justified the backstop mechanism when price caps were first implemented over five years ago, when neither the Commission nor the LECs had experience with incentive regulation. With a comprehensive, economically meaningful TFP study on the record, the need for a backstop to compensate for possible errors in selecting a productivity factor is a feeble rationale for continuing a practice which preserves disincentives that significantly compromise the objectives of price cap regulation. Moreover, the use of a moving average productivity factor obviates the need for a backstop. The Commission has observed that, with a properly selected and applied moving average X-Factor, “the danger of an error in the X-Factor leading to unreasonable high or low rates is reduced substantially, if not eliminated.” Price Cap Review Order, para. 192.

In sum, there is absolutely no reason why the Commission should retain a sharing mechanism in the LEC price cap plan. Sharing is entirely unnecessary under a price cap plan that incorporates a moving average productivity factor such as the TFP factor advocated by

USTA. The arguments of the few parties supporting the retention of sharing are unconvincing when viewed against the substantial record in this proceeding which demonstrates that sharing will limit LEC incentives to fully achieve efficiency gains promised by incentive regulation, will hinder infrastructure development, will needlessly consume Commission and LEC resources, and will frustrate a smooth transition to a competitive market.

B. Arguments for Retention of the Consumer Productivity Dividend are Without Merit

Both AT&T and Ad Hoc argue for the retention of the Consumer Productivity Dividend (CPD) in the LEC price cap plan. According to AT&T, the CPD is necessary to reflect productivity growth *from the pre-price cap era*, and to provide a “stretch factor” for the LECs. AT&T Comments at 35. In contrast to AT&T, Ad Hoc appears to be worried more about productivity growth *during the price cap period* and argues that the CPD will “assure that at least some portion of the efficiency gains expressly attributable to incentive regulation will be flowed through to ratepayers.” Ad Hoc Comments, ETI Study at 63. Ad Hoc also views the CPD as “a sort of ‘advanced payment’ on the sharing obligation that is to be distributed to ratepayers irrespective of realized earnings levels, as compensation for ratepayer acceptance of incentive regulation.” Id.

Contrary to AT&T and Ad Hoc, a CPD is not needed now to flow through productivity gains achieved by the LECs either before or after the start of price caps. First, LEC price cap indexes already reflect five years of the CPD. The 2.5% cumulative CPD impact will continue to be reflected in those indexes in future years. Second, under a moving average TFP productivity factor, increases in LEC productivity will automatically flow through to consumers. Under these circumstances, “adding a CPD to an historical X-Factor measured over a period that includes price cap regulation would effectively double-count expected productivity gains from regulatory reform.” USTA Comments, NERA Report at 33.

Nor is a CPD justified as a “stretch factor” on the grounds that LECs “have remaining

opportunities to achieve further efficiencies.” AT&T Comments at 35. If further efficiencies are achieved by LECs, these efficiencies will be passed on to consumers through the moving average X-Factor.

Finally, it is preposterous for Ad Hoc to suggest that the CPD is justified as “compensation for ratepayer acceptance of incentive regulation.” The Commission concluded that price cap regulation was in the public interest. Consumers, LECs and the nation as a whole all benefit from a properly functioning price cap plan. No group requires compensation for its “acceptance” of price caps or any other initiative that the Commission determines to be necessary to achieve the important public policy goals expected from incentive regulation, such as increased efficiency, infrastructure development and reduced regulatory burdens.

C. The Commission Should Reject AT&T’s Arguments for Continuation of the Periodic Review Process

Despite the substantial and obvious benefits of a moving average X-Factor and its relationship to the elimination of sharing as discussed above, AT&T appears intent on retaining time consuming and resource wasting periodic LEC performance reviews (this review proceeding is now entering its third year.) To this end, AT&T argues that the Commission should retain a fixed productivity factor, and not adopt a moving average X-Factor. AT&T Comments at 33-34. As discussed below, AT&T’s arguments are without merit. Moreover, the alleged problems that AT&T points out with respect to a moving average X-Factor are far more pronounced under a system with a fixed productivity factor and periodic reviews.

AT&T claims that during a period when LEC productivity is increasing, a moving average X-Factor “will systematically understate a LEC’s productivity growth.” AT&T Comments at 33. By its very nature, a moving average will “phase-in” whatever changes are occurring. However, AT&T fails to mention that a moving average would flow productivity

changes more quickly to consumers than would a fixed X-Factor which is likely to remain unchanged for several years and can be modified only following a performance review. Indeed, as noted by USTA in its comments (p. 40), the Commission itself has recognized that a price cap plan based on “a moving average would ensure that the X-Factor reflects the actual performance of the LECs on a more timely basis.” Price Cap Review Order, para. 191.

AT&T also asserts that a “moving average system would undercut the LECs’ efficiency incentives,” allegedly because “LECs might have an incentive to engage in inefficient investment and other cost-increasing tactics designed to reduce short-run productivity measures.” Id. at 34. To the contrary, with a moving average, a single LEC’s strategies should have a minimal impact on the productivity factor. Not only would the LEC’s actions be balanced by other LECs’ independent behavior, the inclusion of five-years’ data and a two-year lag will ensure that there will be no incentives for individual LECs to game the system, either on a short or long-term basis. Further, unlike a fixed factor, a moving average measure of productivity would eliminate any incentive for intertemporal cost shifting. See USTA Comments at 41. In sum, the record demonstrates the superiority of a moving average productivity factor over a fixed factor with performance reviews. Accordingly, the Commission should reject AT&T’s arguments to retain a fixed X-Factor.

IV. The Record Presents No Basis For Retaining a Separate Common Line Formula

While the FNPRM expressed support for adopting the “per-line” common line formula, the FNPRM also correctly noted that an X-factor based on a separate common line formula unnecessary. FNPRM, para. 132. AT&T asserts, with no proof, that the per-line formula is “essential to the proper functioning of the LEC price cap plan.” AT&T Comments at. 43. In fact, the proper functioning of the price cap plan would be to avoid double counting of productivity growth. AT&T’s approach, relying on TFP growth that already includes common line-related productivity, and making a separate duplicative adjustment, is improper. The TFP approach used by Christensen Associates includes all of the output growth associated with CCL

minutes of use (MOU). The fact that LECs recover certain non-traffic sensitive costs (NTS) on a MOU basis is thus fully reflected in the output growth computed in the Christensen Simplified TFP study.⁹ To the extent that loop costs are not traffic sensitive and grow less rapidly than the CCL minutes, the measure of inputs in the Christensen Simplified TFP study also reflect this fact. Thus, the Christensen approach already fully captures any and all productivity growth associated with the fact that CCL minutes may have grown faster than the NTS costs allocated to the Common Line access cost category by the Commission's Part 69 rules. No adjustments to the Christensen TFP results are warranted or appropriate.

The Commission has recently considered and will further consider a number of significant issues with respect to basic reforms in the way in which Common Line revenues are billed (in which non-traffic-sensitive costs are recovered). If the Commission were to now adopt the specific restrictive per-line price cap mechanics for the Common Line price cap basket, it would be prejudging and most possibly thwarting the upcoming more fundamental choices on Common Line rate design and cost recovery issues. For example, if a price LEC were permitted to bill additional Common Line rate recovery amounts on a per-line basis (for example, through higher SLC rates or a Common Line rate structure based on bulk-billing to IXC's on presubscribed lines), the Commission would not be able to properly apply a per-line Common Line price cap index formula that presumes a per-minute CCL rate structure.

The Commission cannot sustain a conclusion that the full influence on growth of CCL demand is attributable to the IXC's and none of that growth is attributable to the LEC's actions. See FNPRM, para. 132. As a straightforward (but not the only) example of this, LEC decisions to lower CCL rates have had significant effects on CCL demand growth. Some price cap LECs have historically priced their CCL below the maximum allowable CCL rate determined by the price cap rules. The Commission cannot reasonably attribute this source of demand growth

⁹ This is also true of all prior versions of the Christensen TFP studies filed by USTA on behalf of the price cap LECs.

solely to the IXCs. Moreover, as USTA noted in its original comments, there is no basis for the Commission to adopt this unsustainable conclusion. There is ample evidence to support adoption of a TFP based productivity offset which fully captures the productivity effect of growth in minutes, and eliminates the need for a separate common line formula. USTA Comments at 44.

V. The Record Presents No Basis for Further Limits on Exogenous Treatment of LEC Cost Increases

In the FNPRM, the Commission asks if it is “feasible to fashion an X-factor that will routinely include costs currently classified as exogenous and exclude costs that the Commission has determined are not exogenous.” The Commission also asks if it would be reasonable to limit exogenous cost treatment to jurisdictional cost shifts. FNPRM, para. 140.

Not a single commenter suggests that such an X-factor could be fashioned. In fact all parties, save MCI, agree that no changes need to be made to the present rules. As AT&T points out, sufficient safeguards exist within the present rules for all parties to have adequate input as to whether such changes are appropriate. Comments of AT&T at 44-46. MCI suggests that exogenous changes should be limited to jurisdictional changes required by the Commission. MCI Comments at 25. MCI’s rationale is that non-regulated companies must determine how to meet these other kinds of changes without being able to change their prices and that price cap regulation should mirror this supposed effect of the competitive market. Id.

Essentially, MCI appears to suggest that the types of changes found to be exogenous cost changes under the Commission’s rules are the result of business decisions. But changes in FCC regulatory fees and Telecommunications Relay Service (TRS) subsidies, for example, are not the result of LEC business decisions, they are the result of FCC action. Competitive companies, not under regulation, have the freedom to move their prices up and down in response to such factors, and in fact do move their prices in response to such factors. MCI’s

argument suggests that LECs should be regulated in a manner which requires them to respond to imposed regulatory changes as if they existed in a purely competitive, unregulated market where such changes are not imposed, but are under the control of the LEC. There is no logical basis to adopt this absurd position.

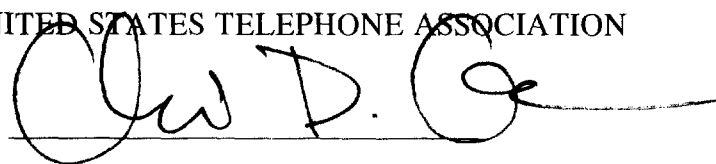
CONCLUSION

The initial comments in this proceeding demonstrate that the simplified Christensen TFP method, calculated as a moving average, is the best method for calculating a productivity offset which meets the Commission's goals that the productivity offset be economically meaningful, administratively simple, and flow through productivity gains to consumers. Particularly with a moving average, there is no need for additional regulations such as sharing, productivity dividends, or periodic price cap reviews. The Commission should adopt the simplified Christensen TFP method as part of a meaningful long-term price cap plan.

Respectfully submitted,

UNITED STATES TELEPHONE ASSOCIATION

BY

A handwritten signature in black ink, appearing to read "Mary McDermott", written over a horizontal line.

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ATTACHMENT A

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**FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY**

**“Total Factor Productivity
Methods for Local Exchange
Carrier Price Cap Plans: Reply
Comments”**

**Laurits R. Christensen, Philip E. Schoech,
and Mark E. Meitzen**

Christensen Associates

USTA Reply Comments 3/1/96

Total Factor Productivity Methods for Local Exchange Carrier Price Cap Plans: Reply Comments

Laurits R. Christensen, Philip E. Schoech, and
Mark E. Meitzen
March 1, 1996

I. Introduction

In response to the issues raised in the Fourth Further Notice of Proposed Rulemaking in CC Docket 94-1 ("Fourth FNPRM"),¹ we developed a simplified TFP model that eases computational requirements and relies entirely on verifiable, publicly-available data.² The simplified model, which forms the basis of the Total Factor Productivity Review Plan (TFPRP)³, is consistent with accepted productivity measurement practices and provides an accurate measure of LEC productivity. Because it is based solely on publicly-available data and relies on simplification of some computations, it can be updated and verified in a straightforward manner.⁴ We believe the TFPRP is the only TFP model proposed by any party that addresses all substantive comments raised by the Commission.

The primary purpose of our reply comments is to respond to issues raised by AT&T and the Ad Hoc Telecommunications Users Committee in their comments to the

¹ Federal Communications Commission, Fourth Further Notice of Proposed Rulemaking, FCC 95-406, September 27, 1995.

² Laurits R. Christensen, Philip E. Schoech, and Mark E. Meitzen, "Total Factor Productivity Methods for Local Exchange Carrier Price Cap Plans," Attachment A to Comments of United States Telephone Association on Fourth Further Notice of Proposed Rulemaking, CC Docket 94-1, January 16, 1996 (hereafter referred to as "Christensen comments").

³ Attachment B to United States Telephone Association on Fourth Further Notice of Proposed Rulemaking, January 16, 1996.

⁴ A summary of the TFPRP can be found in the Executive Summary of the Christensen comments.

Fourth FNPRM. Specifically, we are responding to the statement of Dr. J.R.

Norsworthy that was filed as Appendix A of the AT&T comments⁵ and the report by Economics and Technology, Inc. ("ETI") that was filed with the Ad Hoc comments.⁶

Both the Norsworthy and ETI reports contain numerous critical comments regarding our original USTA LEC TFP study and the 1993 update to that study.⁷ While their critiques do not directly address the simplified data and methods that we described in our comments to the Fourth FNPRM filed on January 16, 1996, most of the methods and data sources used in the original Christensen TFP model and the simplified Christensen TFP model are the same. In order to avoid confusion, we will address the relevance of the Norsworthy and ETI comments to the simplified TFP model.

After careful review of the Norsworthy and ETI statements, we have found none of the criticisms to be justified. Many of the criticisms are based on a misunderstanding of the data used in the Christensen TFP models. Other criticisms are based on a misunderstanding of the methods used to compute TFP or on incorrect inferences from economic theory. None of the criticisms lead to the conclusion that the simplified TFP model needs to be corrected in any way.

The following sections of this report respond to the issues raised in the

⁵ "Analysis of TFP Methods for Measuring the X-Factor of the Local Exchange Carriers' Interstate Access Services," Appendix A to Comments of AT&T on Fourth Further Notice of Proposed Rulemaking, CC Docket 94-1, January 16, 1996 (hereafter referred to as the "Norsworthy report").

⁶ "Establishing the X-Factor for the FCC Long-Term LEC Price Cap Plan," attached to Comments of Ad Hoc Telecommunications Users Committee on Fourth Further Notice of Proposed Rulemaking, CC Docket 94-1, January 16, 1996 (hereafter referred to as the "ETI report").

⁷ "Productivity of the Local Operating Telephone Companies Subject to Price Cap Regulation," May 3, 1994 (hereafter referred to as the "original study"); and "Productivity of the Local Operating Telephone Companies Subject to Price Cap Regulation, 1993 Update," January 16, 1995 (hereafter referred to as the "updated study").

Norsworthy and ETI reports. In particular, we find that the only economically meaningful measure of productivity is LEC total factor productivity and that any measure of “interstate productivity” is not economically meaningful. We furthermore find that the alternative methods offered by Norsworthy and ETI for measurement of output, capital, and materials contain fundamental flaws and are inappropriate for purposes of measuring LEC productivity. Finally, we find that the simplified TFP model needs no modification, and is the appropriate basis for measuring LEC TFP.

II. All Data used in the Simplified Christensen TFP Model are publicly-available and verifiable

Dr. Norsworthy incorrectly asserts that our TFP model relies heavily on non-public proprietary data. While we disagree with his characterization of the original TFP model, this assertion is entirely false for the simplified TFP model. The simplified TFP model is based entirely on publicly-available data. Dr. Norsworthy seems particularly concerned about the use of proprietary data in the construction of the benchmark and asset prices. The simplified TFP model bases the benchmark on ARMIS data and data on the telephone industry collected and published by the U.S. Bureau of Economic Analysis. The asset price indexes are based on prices published by the U.S. Bureau of Economic Analysis, the source recommended by Dr. Norsworthy. Given that the TFP model is based entirely on publicly-available data, Dr. Norsworthy's concern is irrelevant.

Similarly, ETI begins its comments with the “empirical requirements” identified in

the Fourth FNPRM for an appropriate X factor and concludes that the Christensen LEC TFP study fails to meet these requirements. As we discuss below in Section XIV, ETI also goes to great lengths to report on the recent California state proceedings where both Dr. Christensen and Dr. Selwyn testified. The ETI report inaccurately portrays the Christensen study. As explained in our comments to the Fourth FNPRM, the simplified Christensen study has addressed the Commission's concerns about data and methodological issues. Therefore, the ETI concerns have no practical significance.

III. The computation of TFP for only interstate access services is not economically valid

Both the Norsworthy and ETI reports advocate the computation of an "interstate-only" TFP. They falsely claim that one can measure interstate TFP by assuming that inputs grow at the same rates for interstate access and other regulated telephone services provided by the LECs.⁸ As both we and NERA noted in our comments to the Fourth FNPRM,⁹ there is no economically valid partition of LEC inputs into interstate and intrastate inputs. Therefore, there is no economically valid procedure for measuring interstate TFP, Dr. Norsworthy's and ETI's claims notwithstanding.

To separately measure the growth of inputs for interstate services and inputs for

⁸ Although ETI advocates the computation of jurisdictional costs based on Part 36, they conclude that interstate input growth can be approximated by total company input growth. ETI report, p. 50.

⁹ Christensen comments, pp. 26-27 and William E. Taylor, Timothy J. Tardiff, and Charles J. Zarkadas, "Economic Evaluation of Selected Issues from the Fourth Further Notice of Proposed Rulemaking in the LEC Price Cap Performance Review," Attachment C to United States Telephone Association on Fourth Further Notice of Proposed Rulemaking, January 16, 1996, pp. 14-21.

intrastate services would require a meaningful distinction between inputs for interstate services from inputs for intrastate services. Since interstate and intrastate services are produced with joint and common inputs, this would require some arbitrary allocation of the inputs (and their costs). Dr. Norsworthy and ETI perform this arbitrary allocation by simply, and without justification, assuming that inputs and costs grow at the same rate for interstate and intrastate services. As we demonstrate below, this allocation is not economically meaningful and the resulting measure of “interstate productivity” is not valid.

Dr. Norsworthy erroneously claims “the USTA assertion that there is no basis for measuring interstate activity separately is therefore belied by its own model.”¹⁰ His claim is based on the observation that one can compute distinct interstate output from the USTA data set. But computing output is only half of the problem in TFP measurement. Dr. Norsworthy has offered no solution to the problem of computing an economically meaningful measure of interstate input--and he cannot do so because there is no solution to the problem.

Dr. Norsworthy makes an additional claim that one can assume inputs for interstate and intrastate services grow at the same rate without making any specific allocation of costs. While one can “make” this assumption, it provides an economically meaningless result. Assume for a moment that his claim is true. Then one would be able to meaningfully calculate product line productivity for any multi-product firm. Consider for example a paper-clip manufacturer that produces red and blue paper clips.

¹⁰ Norsworthy report, p. 24.

Except for the pigment applied to the paper clip, the process of producing red and blue paper clips is exactly the same. In Table 1, we consider a case where sales of red paper clips increase by 5% while sales of blue paper clips increase 3%, leading to a 4% increase in total paper clip sales. Total input increases 2% and total factor productivity of paper clip production increases by 2%. The assumption that inputs for red and blue paper clips grow at the same rate as total input would lead to the conclusion that productivity growth for red paper clips has been 3% while productivity growth for blue paper clips was only 1%.

Table 1
TFP for a Paper Clip Manufacturer

	1994	1995
Red Paper Clips Sold (millions)	100	105
Blue Paper Clips Sold (millions)	100	103
Total Paper Clips Sold (millions)	200	208
Total Output (1994=100)	100	104
Total Input (1994=100)	100	102
Actual TFP (1994=100)	100	102
Incorrectly Computed Red Paper Clip TFP	100	103
Incorrectly Computed Blue Paper Clip TFP	100	101

If the price of paper clips were regulated, the assumption that inputs for red and blue paper clips grow at the same rate as total input would lead to the insupportable conclusion that the price of red paper clips should be reduced 2 percent relative to blue paper clips. Since one can easily create examples where this assumption yields arbitrary and capricious results, one must conclude that his claim has no economic justification.

IV. The Tornqvist index is the proper choice for productivity research.

Dr. Norsworthy criticizes our LEC TFP model for using the Tornqvist index when constructing total output and total input.¹¹ He falsely characterizes the Tornqvist index as a “poor” choice and recommends the use of an alternative index, the Fisher Ideal index. The Tornqvist index and the Fisher Ideal index have very similar properties and, in fact, they produce identical results in the LEC TFP model. For the simplified TFPRP model, Table 2 shows the rates of total output, total input, and TFP growth when the Tornqvist index is used, and their rates of growth when the Fisher Ideal index is used. As one can see from the table, the results are identical.

¹¹ e.g., Norsworthy report, p. 21, 24.

Table 2
Comparison of Total Output, Total Input, and LEC TFP Growth
Using Tornqvist and Fisher Ideal Indexes
TFPRP Model

	Tornqvist Index			Fisher Ideal Index		
	Total Output	Total Input	TFP	Total Output	Total Input	TFP
1988						
1989	4.7%	2.9%	1.8%	4.7%	2.9%	1.8%
1990	3.8%	0.0%	3.8%	3.8%	0.0%	3.8%
1991	2.7%	0.7%	2.0%	2.7%	0.7%	2.0%
1992	2.0%	-1.5%	3.5%	2.0%	-1.5%	3.5%
1993	4.0%	0.3%	3.7%	4.0%	0.3%	3.7%
1994	3.8%	1.4%	2.4%	3.8%	1.4%	2.4%
Five-Year Averages						
1988-93	3.5%	0.5%	2.9%	3.5%	0.5%	2.9%
1989-94	3.3%	0.2%	3.1%	3.3%	0.2%	3.1%

The fact that the Tornqvist index and the Fisher Ideal index produce identical results is not surprising. Both the Tornqvist index and the Fisher Ideal index are “superlative” index numbers¹² and accurately reflect price and quantity changes for a wide variety of production structures.

Furthermore, even Dr. Norsworthy recognizes that the Tornqvist index and the Fisher Ideal index will generally produce very similar results. In his analysis of total input growth, he states that “total factor input is the sum of indices of individual inputs weighted by their respective shares in total factor cost.”¹³ He goes on: “The statement

¹² See W.E. Diewert, “Exact and Superlative Index Numbers,” Journal of Econometrics, Vol. 4 (1976), pp. 115-145.

¹³ Norsworthy report, p. 39.

holds exactly for the Tornqvist Index in the USTA model. It is approximate *to a rather high degree of accuracy* (emphasis added) in the Fisher Ideal Index used in the Performance-Based Model.”¹⁴

The Tornqvist index has been widely used in productivity research, and it is currently employed by the U.S. Bureau of Labor Statistics in its total factor productivity research. Because the Tornqvist index and Fisher Ideal Index produce the same quantitative results, and because the Tornqvist index is more widely employed in productivity research, we believe that the Tornqvist index is more appropriate for the simplified TFP model.

V. The Christensen output indexes are properly calculated

The ETI report criticizes the Christensen study for allegedly using *ad hoc* methods that were not clearly documented. This allegation is incorrect. We specified in detail in our original study how the output indexes are computed, and we elaborated on our procedures in our comments to the Fourth FNPRM. The output price indexes in question are used to deflate revenues to produce quantity indexes for three services: local, intrastate access, and long distance. As we explain, the formula we use converts Form M rate change data into an index that closely approximates a chain-weighted Paasche price index. The chain-weighted Paasche price index is a conventional price index formula that is theoretically superior to traditional fixed-weight Laspeyres and

¹⁴ Norsworthy report, p. 39, fn. 15.

Paasche price indexes.¹⁵

In addition, Dr. Norsworthy and ETI incorrectly criticize price and quantity indexes for specific service categories. Dr. Norsworthy's criticism of our interstate access measures is based on a misunderstanding of the data used to construct them.¹⁶ Dr. Norsworthy makes a false distinction between the construction of his interstate access quantity indexes and our interstate access indexes. He characterizes his interstate access quantity indexes as being based on physical units of output and characterizes our quantity indexes as being based on deflated revenue. ETI also makes this false distinction.¹⁷

As we discussed in our original TFP study report (page 3), the price indexes we used in our LEC TFP model for end-user access and interstate switched access are derived directly from physical output measures (in fact from the very same physical output measures recommended and used by Dr. Norsworthy). The price of end-user access is the ratio of revenue to the number of access lines. The price of switched access is constructed by first computing a Tornqvist quantity index of common line minutes of use and traffic sensitive minutes of use and then dividing total switched access revenue by this quantity index. This means that the end-user service quantity index is based on the number of access lines and the total switched access service quantity index is a Tornqvist index of common line and traffic sensitive minutes-of-use.

The only subclass of interstate access where Dr. Norsworthy's methods differ

¹⁵ See Christensen comments, p. 5.

¹⁶ Norsworthy report, p. 23.

¹⁷ ETI comments, pp. 17-18.

from those in the simplified TFP model is special access. Dr. Norsworthy bases his quantity index for special access on the number of special access lines, a simplistic choice for measuring special access output.¹⁸ Our special access output index is based on an economic price index of special access services and accurately reflects those services sold by the LECs.

Dr. Norsworthy also criticizes our local and long distance output indexes and erroneously states that they “may understate output because the price indices may not include discounts - a major element of competition in long distance service - while the revenues do.”¹⁹ Dr. Norsworthy appears to confuse the market for inter-exchange service, where discounting is a significant activity, with the market for local and intra-LATA toll, where discounting from tariffed rates is less common. Dr. Norsworthy also proposes to measure local and long distance service using two physical measures of output: number of local calls and toll minutes of use. As we discussed in our original TFP model report (page 1) the heterogeneity of telephone service makes it inappropriate to use simple measures of physical output. Local service includes access, usage, and vertical services. Long distance service includes message service, unidirectional service, and private line service. These services are further differentiated by numerous characteristics such as distance and time-of-day. The number of local

¹⁸ Dr. Norsworthy also incorrectly asserts (page 73) that “the USTA model is distorted by the price for special access services, which rises from an index value of 100% (sic) in 1984 to over 700% (sic) in 1989.” He cites as his source worksheets submitted by Christensen Associates in the California PUC proceedings. Dr. Norsworthy’s assertion is incorrect. The special access price index is indexed to 1.000 in 1984 and has a value of .755 in 1993. Between 1984 and 1993 the annual rates of change vary from -7.94% to +2.57%. This was accurately reported in the workpapers cited by Dr. Norsworthy.

¹⁹ Norsworthy report, p. 25.